

Maquoketa river.—Monticello, Jones county, Iowa; ice went out of the river on the 5th, river closed again on the 14th, on the 20th the ice was fourteen inches thick.

Arkansas river.—West Las Animas, Colorado: the river froze over on the 24th.

Fort Smith, Arkansas: ice formed in the river on the 18th; floating ice observed on 19th, 20th, 24th, 25th, 28th, 29th.

Ohio river.—Pittsburg, Pennsylvania: floating ice on the 4th, 5th, and from the 18th to 31st.

Leetsdale, Allegheny county, Pennsylvania: floating ice in river nearly the entire month.

Portsmouth, Scioto county, Ohio: river full of floating ice from 21st to 31st.

Cincinnati, Ohio: floating from 23d to 31st; navigation suspended from 25th to 29th; river clear of ice on 31st.

Louisville, Kentucky: floating ice from 19th to 31st; on the 21st navigation was suspended at all points from Pittsburg to Cairo; navigation was resumed on the 29th.

Laconia, Indiana: floating ice on the 23d.

Mississippi river.—Saint Paul, Minnesota: the river remained frozen throughout the month.

La Crosse, Wisconsin: floating ice on 3d; river froze on 17th.

Dubuque, Iowa: floating ice from 1st to 4th, 6th, 7th, 9th to 17th; river frozen from 18th to 31st.

Davenport, Iowa: floating ice on 1st, 2d, 7th to 17th; river closed on 18th; on the 20th pedestrians crossed on the ice, and on the 22d teams crossed. The ferryboats made their last trips on the 15th.

Burlington, Iowa: floating ice on 11th; river closed during the night of 18–19th.

Keokuk, Iowa: floating ice on 1st; on the 5th the river was free of ice, and the steamers "Plough Boy" and "Rescue" made regular trips. Navigation was again suspended on the 12th on account of drift ice; on the 20th an ice-dam formed; the river froze over on the 21st.

Cairo, Illinois: large quantities of floating ice on the 19th, closing navigation to the northward; the heavy drift ice on the 26th caused considerable damage; two boats were sunk, one of which contained 6,000 bushels of coal.

Memphis, Tennessee: ice formed along the shores on the 23d; floating ice from 23d to 27th; on the latter date navigation was suspended on account of ice, which was reported in the Mississippi, as far southward as the mouth of the Arkansas river, two hundred and fifteen miles from Memphis.

Missouri river.—Fort Buford, Dakota, river closed on 14th.

Yankton, Dakota: river froze on the 15th.

Omaha, Nebraska: river froze during the morning of the 17th.

Fort Sully, Dakota: floating ice on 2d, 3d; river clear on 4th; floating ice on 10th and 11th; river closed during night of 16–17th. No boats ran north of Yankton after November 27th.

Fort Bennett, Dakota: river froze on 17th.

Leavenworth, Kansas: ice-dam formed on 16th; river closed on 18th.

Miscellaneous.—Baltimore, Maryland, 27th: ice, in sufficient quantities to interrupt navigation, is reported from the smaller tributaries to the bay.

Delaware Breakwater, Delaware, 19th: ice six inches thick.

Fort Scott, Kansas: at close of the month ice was ten inches thick.

FLOODS.

Arkansas.—Little Rock, 31st: reports from points along the Memphis and Little Rock railroad state that in many places along this road the country is covered with water, and in some instances it reached the level of the road bed. Reports from along the line of the Iron Mountain road stated that similar conditions existed in the country through which that road passes. A train from Arkansas City, due at Little Rock at 8.46 p. m. on the 29th, did not arrive until 7.30 on the

following morning, and the passengers reported that in some places the whole country was under water; from Pine Bluff to Arkansas City all of the large plantations were inundated.

California.—Sacramento: the Sacramento river on the 27th, reached a height of 24 feet 7 inches, or within 1 foot 11 inches of high water mark. The American river began to fall on the 26th, after having overflowed many of the hop-fields in the vicinity of Brighton. Reports from Marysville, Yuba county, on the 26th, stated that the water in Feather river had reached the top of some of the levees in Sutler county, about sixteen miles below Marysville.

It is reported from Nevada City, Nevada county, that in that vicinity the Yuba river reached the highest point on the 25th that has been known since 1862.

At Chico, Butte county, the Butte creek levee gave way on the 25th, and a large volume of water poured through the breaks.

At Linden, San Joaquin county, the water was from three to four feet deep in the town, and many small bridges in the vicinity were washed away.

Stockton, San Joaquin county: on the morning of the 25th, the Moss tract of land, west of this place, was flooded, causing a loss of from \$40,000 to \$50,000.

On the 26th, the mountain streams in Calaveras and Tuolumne counties, were much swollen, endangering the levees and causing suspension of travel.

Merced, Merced county: on the 26th, the low grounds in this vicinity were flooded and the country to the west of this place was under water for miles. The approaches of the bridge over Merced river were endangered.

In the vicinity of Plainsburg, the water reached the highest point known for several years.

Michigan.—Ionia, Ionia county: the Grand river at this place overflowed on the 31st.

HIGH TIDES.

Eastport, Maine, 3d.

New River Inlet, North Carolina, 6th.

Fort Canby, Washington Territory, 3d.

LOW TIDES.

Baltimore, Maryland, 19th.

New River Inlet, North Carolina, 23d, 24th.

Indianola, Texas, 1st, 2d, 7th, 13th, 14th, 18th, 19th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for December, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 79.73 per cent. The percentages for the four elements are: Weather, 85.36; direction of the wind, 76.99; temperature, 74.95; barometer, 86.48 per cent. By geographical districts, they are: For New England, 81.53; middle Atlantic states, 85.23; south Atlantic states, 82.76; eastern Gulf states, 81.41; western Gulf states, 80.63; lower lake region, 75.73; upper lake region, 78.90; Ohio valley and Tennessee, 78.89; upper Mississippi valley, 77.68; Missouri valley, 75.26; north Pacific coast region, 78.23; middle Pacific coast region, 79.84; south Pacific coast region, 76.61. There were three omissions to predict out of 3,066, or 0.10 per cent. Of the 3,063 predictions that have been made, one hundred and seventy-six, or 5.75 per cent., are considered to have entirely failed; one hundred and seventy-four, or 5.68 per cent., were one-fourth verified; three hundred and ninety-four, or 12.86 per cent., were one-half verified; four hundred and sixty-nine, or 15.31 per cent., were three-fourths verified; 1,850, or 60.40 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During December, 1884, one hundred and eighty-six cautionary signals were ordered. Of these, one hundred and

sixty-one, or 86.56 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Sixty-nine off-shore signals were ordered, of which number fifty-nine, or 85.51 per cent., were fully justified, both as to direction and velocity; sixty-three, or 91.30 per cent., were justified as to direction; and sixty, or 87.95 per cent., were justified as to velocity. Two hundred and fifty-five signals of all kinds were ordered, two hundred and twenty, or 86.27 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals thirty-six were changed from cautionary. Three signals were ordered late. In one hundred and twenty cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

There were one hundred and seventy-six cold-wave signals ordered during December, of which number, one hundred and thirty-four, or 76.1 per cent. were justified.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the Alabama weather service, in his December report, makes the following statement:

A careful examination of the meteorological reports from all quarters of the state shows the verification of the weather predictions to be 83 per cent., and of the temperature 90 per cent.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air at the stations.

Temperature of water for December, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	49.6	34.3	14.6	ft. 2	37.5
Alpena, Michigan*	34.7	29.7	3.0	11 7	23.2
Augusta, Georgia	54.1	40.8	13.3	9 1	50.7
Baltimore, Maryland	48.3	35.1	13.2	9 9	37.4
Block Island, Rhode Island	47.9	30.8	17.1	7 4	37.0
Boston, Massachusetts	38.9	30.4	8.5	21 4	33.1
Buffalo, New York*	38.9	32.4	6.5	10 11	29.8
Canby, Fort, Washington Territory†	49.3	33.6	15.7	17 11	36.5
Cedar Keys, Florida	67.6	55.0	12.6	9 8	60.7
Charleston, South Carolina	58.5	49.4	9.1	41 8	53.7
Chicago, Illinois*	35.9	31.8	4.1	6 11	28.4
Chincoteague, Virginia*	52.0	31.0	21.0	4 0	40.8
Cleveland, Ohio*	40.2	31.6	8.6	14 0	30.0
Detroit, Michigan*	39.7	33.0	6.7	23 3	30.5
Delaware Breakwater, Delaware	52.7	32.5	20.2	8 3	39.5
Duluth, Minnesota*	36.5	34.2	2.3	9 11	10.3
Eastport, Maine	43.1	38.7	4.4	15 0	26.3
Escanaba, Michigan*	38.2	32.9	5.3	17 0	19.7
Galveston, Texas	63.3	46.2	17.1	12 2	57.6
Grand Haven, Michigan*	38.0	39.2	5.8	19 0	28.4
Indianola, Texas	68.2	41.5	26.7	8 0	54.0
Jacksonville, Florida	62.5	58.8	3.7	18 0	58.4
Key West, Florida	78.9	70.7	8.2	16 10	73.0
Mackinaw City, Michigan*	39.1	31.5	7.6	10 0	25.1
Macon, Fort, North Carolina	59.3	43.0	16.3	6 9	48.8
Marquette, Michigan*	38.0	34.7	3.3	10 0	20.4
Milwaukee, Wisconsin*	37.3	34.3	3.0	8 0	22.7
Mobile, Alabama	59.1	49.6	9.5	14 9	53.9
New Haven, Connecticut	44.5	30.5	14.0	15 2	31.5
New London, Connecticut	40.4	38.3	8.1	11 7	34.5
New York City	44.0	34.0	10.0	15 6	34.0
Norfolk, Virginia	52.0	37.1	14.9	16 6	45.2
Pensacola, Florida	63.1	52.0	11.1	17 5	56.0
Portland, Maine	40.9	30.5	10.4	13 7	30.7
Portland, Oregon	45.4	31.4	14.0	53 9	31.0
Sandusky, Ohio*	39.5	34.0	5.5	8 11	30.9
Sandy Hook, New Jersey	47.5	34.6	12.9	2 0	36.1
San Francisco, California	55.2	51.0	4.2	34 4	52.5
Savannah, Georgia	50.8	47.8	9.0	10 0	54.4
Smithville, North Carolina	59.0	48.5	10.5	10 5	49.3
Toledo, Ohio*	36.4	32.4	4.0	11 9	30.0
Wilmington, North Carolina	56.7	43.0	13.7	19 6	51.2

* Observations interrupted by ice.—See text.

† Record for 29 days.

Observations were interrupted by ice during the month as follows: Alpena, Michigan, from 17th to 31st; Buffalo, New York, from 19th to 28th; Chincoteague, Virginia,

20th; Cleveland, Ohio, on 9th, 15th, 18th, and from 20th to 31st; Detroit, Michigan, from 8th to 31st; Duluth, Minnesota, from 16th to 31st; Escanaba, Michigan, 14th, 15th, and from 18th to 31st; Grand Haven, Michigan, from 18th to 27th; Mackinaw City and Marquette, Michigan, from 18th to 31st; Milwaukee, Wisconsin, from 13th to 31st; Sandusky, Ohio, from 16th to 31st; Toledo, Ohio, 3d, 4th, and from 17th to 31st.

ATMOSPHERIC ELECTRICITY.

AUROSAS.

Auroral displays occurred during December as follows:

Beloit, Wisconsin, 8th: an auroral arch above a dark cloud was observed at 9.30 p. m.

Fort Totten, Dakota, 8th: an auroral light of pale yellow color, with dark segment beneath, was observed from 9.20 to 11.45 p. m.

Riley, Illinois, 10th.

Saint Vincent, Minnesota, 15th: at 5.30 p. m. a faint auroral display was observed.

Moorhead, Minnesota, 15th: an aurora was observed at 5.15 a. m., consisting of a pale glow and an arch resting upon a dark segment. In the evening on the same day a similar display was observed, appearing at 6.15 and continuing until early morning of the 16th.

Boyne, Michigan, 19th: auroral light extending to an altitude of 15°.

Alpena, Michigan, 19th: an aurora was observed at 9 p. m., consisting of a diffuse light on the northeastern horizon; no streamers were observed; the display ended at 11 p. m.

Escanaba, Michigan, 19th: a faint aurora of pale yellow color was observed from 10 to 10.50 p. m.

Le Roy, New York, 19th: aurora at 8.30 p. m.

Eastport, Maine, 19th: a faint auroral light of straw color was observed from 8 to 10 p. m.

Point Judith, Rhode Island, 20th: an auroral display was observed at 1.13 a. m., consisting of two yellow beams which remained visible twenty minutes; at 2 a. m. a low arch formed which remained until 3 a. m.

Fort Totten, 22d: an aurora in the north with shooting beams of 20° altitude was observed from 9 to 11.50 p. m.

Saint Vincent, Minnesota, 22d: a faint auroral display was noted from 7.10 to 11 p. m.; it consisted of a poorly defined arch of light of 15° altitude, extending over the northern horizon.

Escanaba, Michigan, 22d: an auroral display was visible from 10.15 p. m. until the early morning of the 23d; it consisted of a dark segment beneath a bright yellow light, from which beams extended to an altitude of 45°.

At Harvard College, Cambridge, Massachusetts, auroras were suspected on the following dates: 16th, 3 a. m.; 29th, 11 p. m.; 20th, 8.30 p. m.; 30th, 8.30 p. m.

The "Canadian Weather Review" for December, 1884, reports auroras as follows:

Winnipeg, Manitoba, 8th, 9th, 14th, 15th, 20th, 21st, 22d.

Halifax, Nova Scotia, 14th.

Charlottetown, Prince Edward Island, 14th, 19th, 27th.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the different states and territories as follows:

Alabama.—Birmingham, 11th, 21st; Greensborough, 20th; Mobile, 22d.

Arizona.—Maricopa, 7th; Tucson, 8th; Wickenburg and Prescott, 7th, 8th; Fort Grant, 7th, 9th; Fort McDowell, 7th, 8th, 9th, 10th, 12th, 26th, 27th.

Arkansas.—Fort Smith, 4th, 26th, 30th; Lead Hill, 5th, 26th, 30th; Mount Ida, 28th, 29th, 30th.

California.—Fort Bidwell, 3d, 21st; Poway, 7th, 11th; Los Angeles, 8th; San Francisco and San Raphael, 24th, 25th; Oakland, 25th; at Salinas City, thunder was occasionally heard from 17th to 24th.